

## 1A Low Dropout Regulator with Enable



### General Description

The FP9101 is a high performance positive voltage regulator designed for use in applications requiring very low Input voltage and very low dropout voltage at up to 1A. It operates with a VIN as low as 1.6V and VDD voltage 5V with output voltage programmable as low as 0.8V. The FP9101 features include ultra low dropout, ideal for applications where  $V_{OUT}$  is very close to  $V_{IN}$ . Additionally, there is an enable pin to further reduce power dissipation while shutdown. The FP9101 provides excellent regulation over variations in line, load and temperature. The FP9101 provides a power OK signal to indicate if the voltage level of  $V_{OUT}$  reaches 90% of its rating value.

The FP9101 is available in the SOP8 package. It is available with 1.2V, 1.5V, 1.8V and 2.5V internally preset outputs that are also adjustable using external resistors.

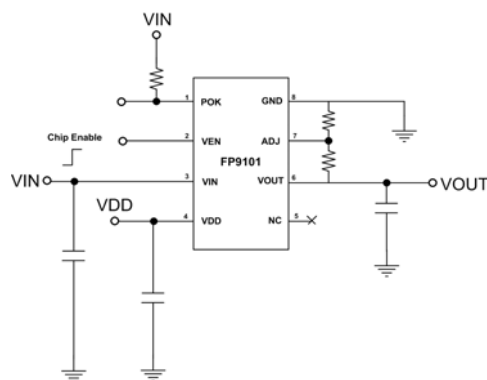
### Features

- Adjustable Output Low to 0.8V
- Input Voltage as Low as 1.6V and VDD Voltage 5V
- High Accuracy Output Voltage:  $\pm 2\%$
- 1.2V, 1.5V, 1.8V, 2.5V Options and Adjustable Externally Using Resistors
- Typically 250mV Dropout at 1A
- OCP, OVP & Thermal Shutdown Protections
- Power Good Output
- Output Voltage Pull Low Resistance when Disable
- Package: SOP8

### Applications

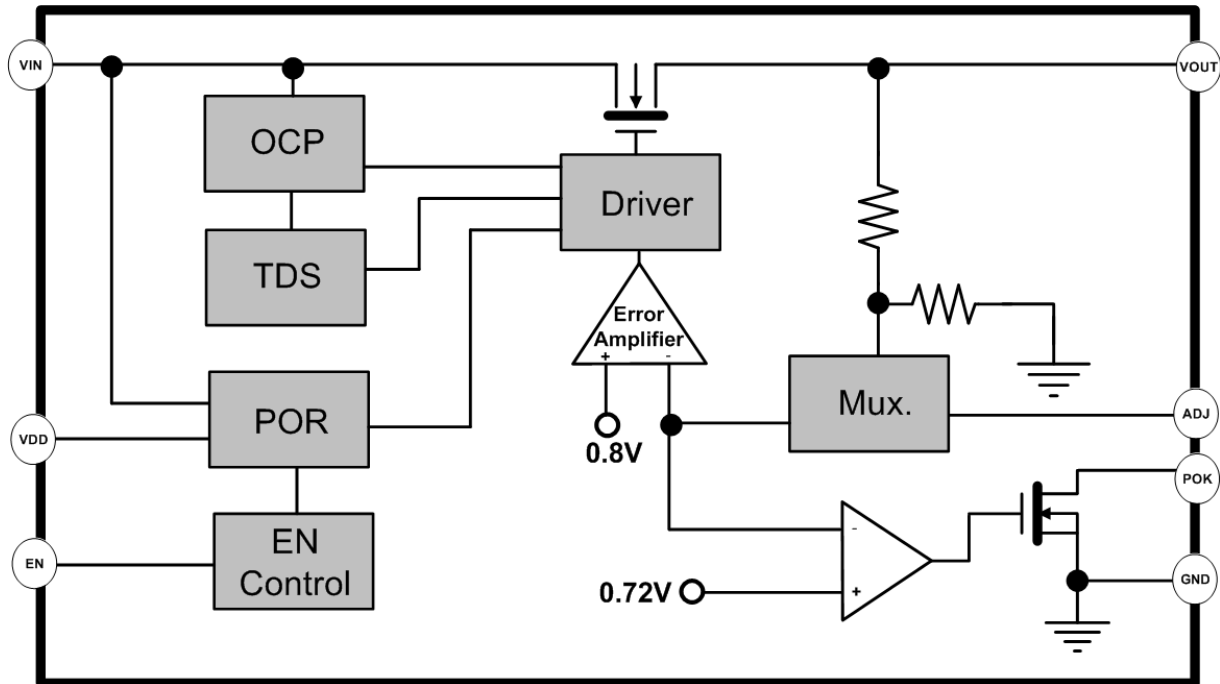
- Motherboard Applications
- Notebook PC Applications
- Network Cards

### Typical Application

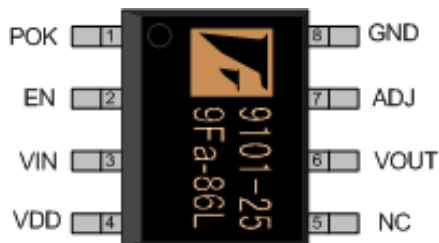


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## Function Block Diagram



## Marking View

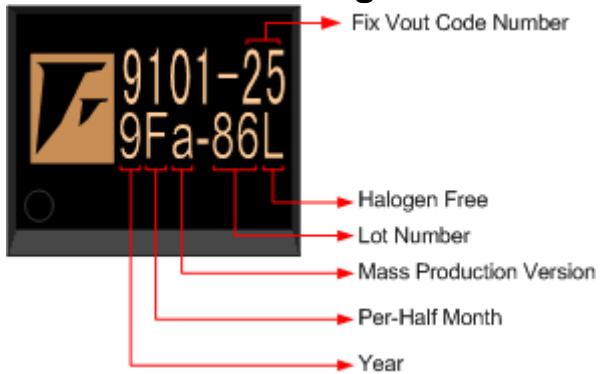


## Pin Descriptions

Name	No.	I/O	Description
POK	1	O	Power Good Open Drain Output
EN	2	I	Enable Control
VIN	3	P	Supply Input Voltage
VDD	4	P	Supply Voltage of Control Circuit
NC	5	-	No Internal Connection
VOUT	6	O	Output Voltage
ADJ	7	I	Adjust Feedback Resistors or connect to Ground
GND	8	O	IC Ground

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## IC Date Code Distinguish



### NOTE:

Lot Number  
(It is the last two numbers of wafer lot number.)

Example:  
132371TB → 71

Per-Half Month

Example:  
January → A(Front Half Month),B(Last Half Month)  
February → C(Front Half Month),D(Last Half Month)

**Order Information**

Part Number	Operating Temp.	Package	MOQ	Description
FP9101-12D-LF	-25°C ~ +85°C	SOP8	100ea	Tube
FP9101-15D-LF	-25°C ~ +85°C	SOP8	100ea	Tube
FP9101-18D-LF	-25°C ~ +85°C	SOP8	100ea	Tube
FP9101-25D-LF	-25°C ~ +85°C	SOP8	100ea	Tube
FP9101-12DR-LF	-25°C ~ +85°C	SOP8	2500ea/Reel	Tape & Reel
FP9101-15DR-LF	-25°C ~ +85°C	SOP8	2500ea/Reel	Tape & Reel
FP9101-18DR-LF	-25°C ~ +85°C	SOP8	2500ea/Reel	Tape & Reel
FP9101-25DR-LF	-25°C ~ +85°C	SOP8	2500ea/Reel	Tape & Reel

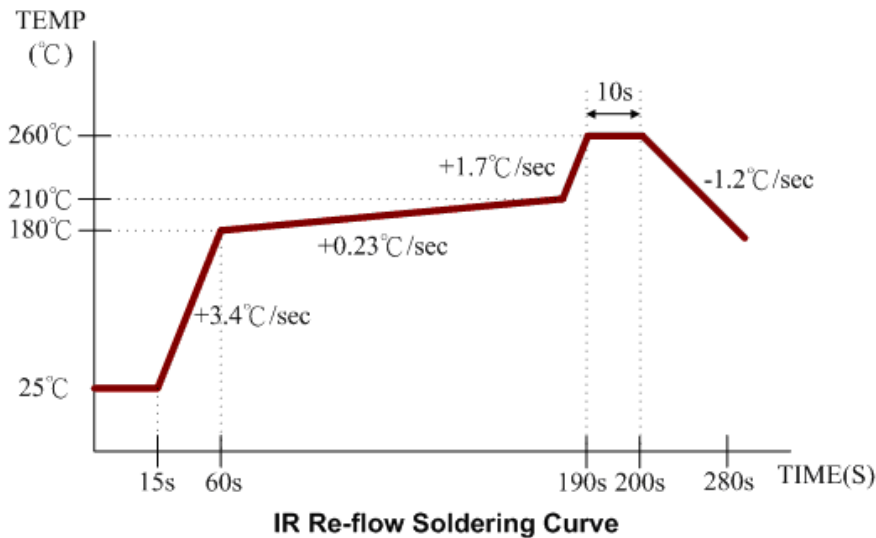
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### Absolute Maximum Ratings (Note1)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply Voltage	V <sub>IN</sub>		1.6		5.5	V
Power Supply Voltage	V <sub>DD</sub>		4.5		5.5	V
Output Voltage	V <sub>OUT</sub>		0.8		5.5	V
Power Dissipation	P <sub>D</sub>	SOP8 @ T <sub>A</sub> =25°C			570	mW
Thermal Resistance	θ <sub>JA</sub>	SOP8		165 <sub>(Note2)</sub>		°C/W
	θ <sub>JC</sub>			45		°C/W
Junction Temperature	T <sub>J</sub>				150	°C
IR-Reflow Lead Temperature	T <sub>IR</sub>	Soldering10sec			260	°C
Operating Temperature	T <sub>OP</sub>		-25		85	°C
Storage Temperature	T <sub>ST</sub>		-55		125	°C
Junction Temperature	T <sub>J</sub>				150	°C

**Note:**

1. Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating conditions are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.
2. Mounted on Recommended Minimum Footprint.



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## Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply Voltage	$V_{IN}$	-	1.6	-	5.5	V
Power Supply Voltage	$V_{DD}$	-	4.5	-	5.5	V
Operating Temperature Range	$T_{OP}$	-	-20	-	85	°C

## DC Electrical Characteristics

( $V_{IN}=V_{OUT}+500mV$ ,  $V_{DD}=5V$ ,  $C_{IN}=C_{OUT}=10\mu F$ ,  $T_A=T_J=25^\circ C$ , unless otherwise specified (Note3))

### ADJ section

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reference voltage	$V_{REF}$	$V_{ADJ}=V_O$	0.788	0.8	0.812	V
Adjust Current	$I_{ADJ}$			20	100	$\mu A$
Adjust Threshold	$V_{ADJ}$		0.15	0.2	0.25	V

### Chip Enable (EN) section

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
EN Input Bias Current	$I_{EN}$	$V_{EN}=0V$		12		$\mu A$
EN Threshold Voltage	$V_{ENH}$	Logic-High Voltage	1.6			V
	$V_{ENL}$	Logic-Low Voltage			0.4	V

### Power Good (POK) section

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Good Rising Threshold Voltage	$V_{THPOK}$			92		%
Power Good Hysteresis	$\Delta V_{THPOK}$			7		%
Power Good Sink Capability	$I_{POK\_SINK}$	$I_{POK}=10mA$		0.2	0.4	V

### Thermal Shutdown Protection section

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal Shutdown Temperature	$T_{SD}$			150		°C
Thermal Shutdown Hysteresis	$\Delta T_{SD}$			30		°C

### Output section

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Fixed Output Voltage Range	$\Delta V_{OUT}$	$V_{IN}=V_{OUT}+0.5V$	-2	0	+2	%
Line Regulation ( $V_{IN}$ )	$\Delta V_{LINE\_V_{IN}}$	$V_{IN}=V_{OUT}+0.5V$ to 5V, $I_{OUT}=1mA$		0.2	0.6	%
Load Regulation( $V_{OUT}$ ) (Note2)	$\Delta V_{LOAD\_V_{OUT}}$	$V_{IN}=V_{OUT}+1V$ , $I_{OUT}=1mA$ to 1A		0.2	1	%
Dropout Voltage (Note3)	$\Delta V_{DROP}$	$I_{OUT}=1A$		250	320	mV
Current Limit	$I_{LIM}$			2.2		A
Short Circuit Current	-			0.8		A
Pull Low Resistance	-	$V_{EN}=0V$		90		$\Omega$

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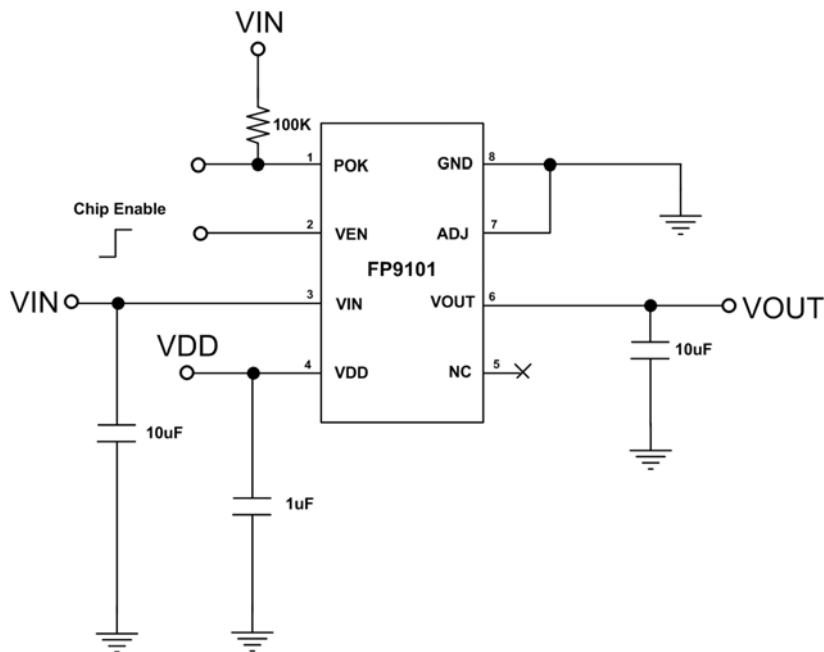
**Total Device section**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
V <sub>IN</sub> Input Voltage Range	V <sub>IN</sub>		1.6		5.5	V
V <sub>DD</sub> Input Voltage Range	V <sub>DD</sub>		4.5		5.5	V
Quiescent Current(Ground current) (Note4)	I <sub>QH</sub>	V <sub>OUT</sub> =Fix Output Voltage		1	2	mA
	I <sub>QL</sub>	V <sub>EN</sub> =0V		26	50	μA

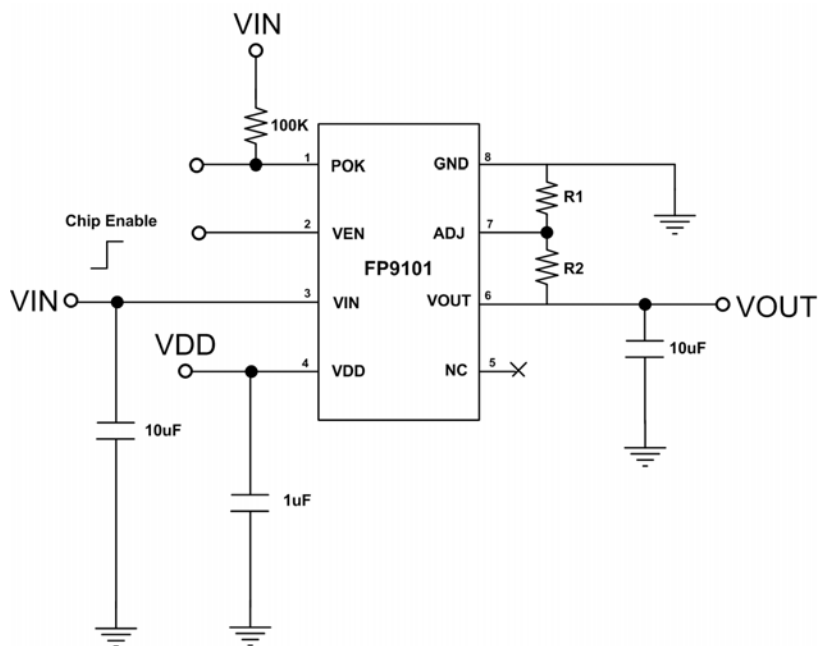
**Note:**

1. Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.
2. Regulation is measured at constant junction temperature by using a 2ms current pulse. Devices are tested for load regulation in the load range from 1ma to 1A
3. The dropout voltage is defined as V<sub>IN</sub>-V<sub>OUT</sub>, which is measured when V<sub>OUT</sub> is normal V<sub>OUT</sub>-100mV.
4. Quiescent current is the difference between input and outputs. It is defined by I<sub>Q</sub>=I<sub>IN</sub>-I<sub>OUT</sub> under no load condition (I<sub>OUT</sub>=0mA). The total current drawn from the supply is the sum of the load current plus the ground pin current

## Application Information



**Figure.01**  
Fixed Voltage Regulator Circuit



**Figure.02**  
Adjustable Voltage Regulator Circuit

**For example:**

The output voltage formula is:

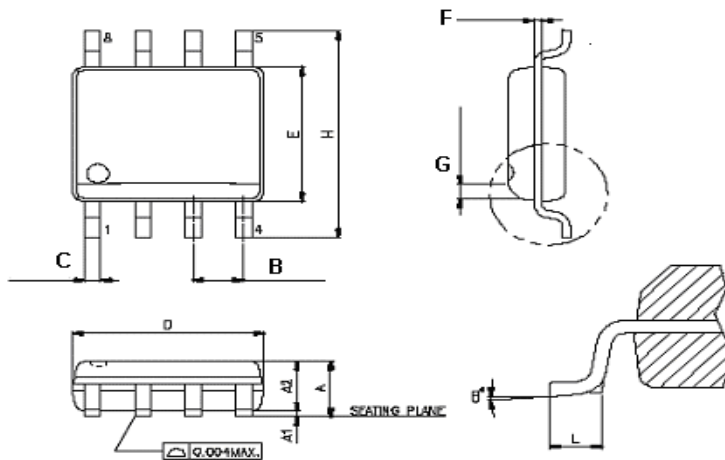
$$V_{OUT} = 0.8 * \frac{R1+R2}{R2} = 0.8V * \frac{15K + 10K}{10K} = 2.0V$$

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## Package Outline

### SOP8



Symbols	Min. (mm)	Max. (mm)
A	1.346	1.752
A1	0.101	0.254
A2	-	1.498
B	1.27 BSC.	
C	0.4064 BSC.	
D	4.800	4.978
E	3.810	3.987
F	0.2032 BSC.	
G	0.381×45°BSC.	
H	5.791	6.197
L	0.406	1.270
$\theta^\circ$	0	8

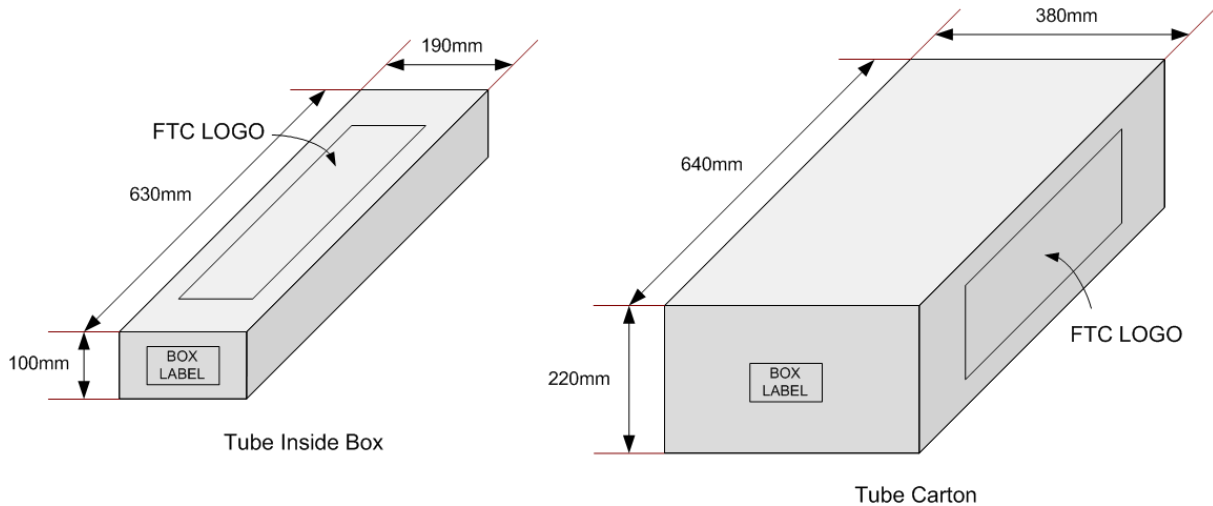
### Note:

- 1 Jedec outline: N/A
- 2 Dimensions "D" does not include mold flash, protrusions or gate burrs mold flash. Protrusions and gate burrs shall not exceed 15mm (006in) per side.
- 3 Dimensions "E" does not include inter-lead flash or protrusions inter-lead flash and protrusions shall not exceed.25mm (.010in) per side.

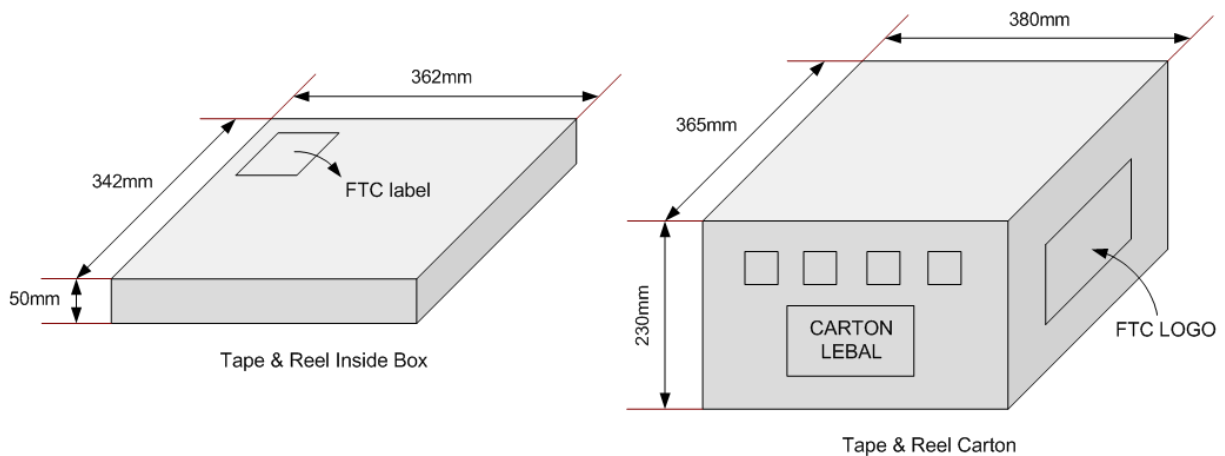
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## Packing Specifications

### Box Dimension



### Tube Inside Box and Carton



### Tape & Reel Inside Box and Carton

## Packing Quantity Specifications

FP9101-XX-LF SOP8	FP9101-XXR-LF SOP8
100 ea/Tube	2500 ea / Reel
100 Tubes / Inside Box	1 Reel / Inside Box
4 Inside Boxes / Carton	4 Inside Boxes / Carton

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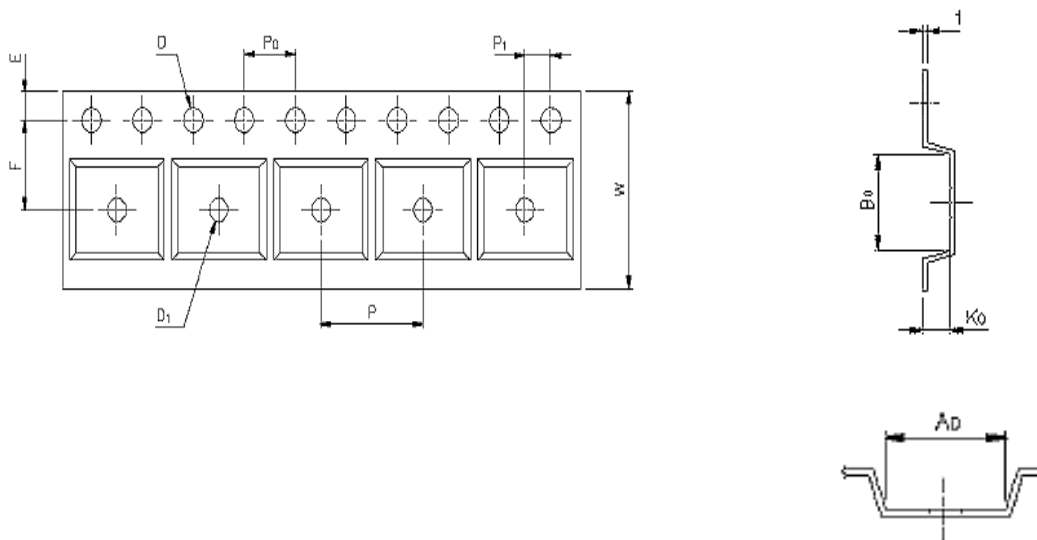
## Carrier Tape Dimensions

### SOP-8L

Application	W	P	E	F	D	D1
SOP8	12.0 <sup>+0.3</sup> <sub>-0.1</sub>	8.0±0.1	1.75±0.1	5.5±0.1	1.55±0.1	1.5±0.25

Application	P <sub>0</sub>	P <sub>1</sub>	A <sub>D</sub>	B <sub>0</sub>	K <sub>0</sub>	T
SOP8	4.0±0.1	2.0±0.1	6.4±0.1	5.20±0.1	2.1±0.10	0.30±0.013

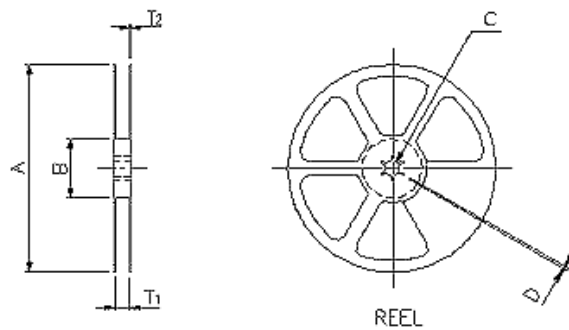
UNIT:mm



### Reel Dimensions

Application	Material	A	B	C	D	T <sub>1</sub>	T <sub>2</sub>
SOP8	Plastic Reel	330±0.1	62±1.5	12.75±0.15	2±0.6	12.4±0.2	2.0±0.2

UNIT:mm



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